INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
SITE INVESTIGATION PROGRAM

SAMPLING
WORK PLAN FOR
EXPANDED SITE ASSESSMENT

SITE NAME: Beck's Lake Site

LOCATION: South Bend, St. Joseph County, IN

EPA ID#: IND980904376

Prepared by
Site Investigation Program
Indiana Department of Environmental Management

Preparer: Tim Johnson Date _____

Reviews and Approvals:

Project Manager: _____ Date _____

Site Investigation Chief: _____ Date _____

Geology: _____ Date _____

Chemistry: _____ Date _____

Health and Safety Officer: _____ Date _____

U.S. EPA: _____ Date _____

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
SITE INVESTIGATION PROGRAM

SAMPLING
WORK PLAN FOR
EXPANDED SITE ASSESSMENT

SITE NAME: Beck's Lake Site

LOCATION: South Bend, St. Joseph County, IN

EPA ID#: IND980904376

Prepared by
Site Investigation Program
Indiana Department of Environmental Management

Preparer: Tim Johnson Date _____

Reviews and Approvals:

Project Manager: _____ Date _____

Site Investigation Chief: _____ Date _____

Geology: _____ Date _____

Chemistry: _____ Date _____

Health and Safety Officer: _____ Date _____

U.S. EPA: _____ Date 10/1/09

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
SITE INVESTIGATION PROGRAM
WORK PLAN

SECTION I. General Information

SITE NAME: Beck's Lake Site

LOCATION: South Bend, St Joseph County, IN

PROPOSED DATE OF INSPECTION: October 6-8, 2009

ESTIMATED FIELD HOURS (per worker): 20

PROJECT OBJECTIVE: To identify a source area and to determine the number of targets affected by Arsenic contamination identified during the Beck's Lake CERCLA Reassessment in June of 2003. The ultimate objective of the sampling event is to determine if the site scores for the National Priorities List of Hazardous Waste Sites (NPL).

PROJECT DESCRIPTION: IDEM records identify that Bendix notified in 1984 that they dumped waste materials in the Beck's Lake dump during the late 1930's to the 1950's. Findings at the SI and RA stage revealed that only metals were of concern at this property. Sampling will be conducted to expand upon information that was collected at the Reassessment stage of the Beck's Lake Site investigation. Samples will be collected near or on potential source areas to determine attribution for high arsenic levels identified within residential yards in the Beck's Lake area. Samples will also be collected in additional residential yards and neighborhoods to determine the extent of the arsenic contamination and to use the data to score the site under the guidelines of the CERCLA program for listing sites on the NPL.

BACKGROUND REVIEW PERFORMED: ☒ Yes ☐ No

Preliminary HRS Route Score: GW _____ SW _____ AIR _____

SE _____ F&E _____

Total Score (Sm) _____

Projected HRS score with field work: GW SW AIR _____

SE 57.6 F&E _____

Total Score (Sm) 28.8

INSPECTION PRIORITY: ☐ Low ☐ Medium ☒ High

WP-2

SECTION II. Site/Waste Characteristics

TYPE OF FACILITY: The arsenic contamination is believed to be from a dump site once used by Bendix Corporation, a manufacturer of parts for automotive and airline industry. Aerial photos from the Indiana State Archives revealed evident dumping or fill in the area now known as LaSalle Park where Beck's Lake currently stands. A 103C Notification of Hazardous Waste Sites for the Bendix Corporation indicated dumping had occurred at this location and waste materials from Bendix included arsenic contaminated foundry sand.

SITE DESCRIPTION: The site lies in a mostly residential mix of properties with a few industries sprinkled around the area. It is a park (LaSalle Park) with a lake on the property and is a former dumpsite for Bendix Corporation. There is a manmade hill on the site that is allegedly filled with debris from a former housing project on the property. There are also paved basketball and tennis courts on the property, an old backstop, and community buildings on the Southwest corner of the park.

DISPOSAL METHODS: Waste materials from Bendix were dumped on the site until the mid 1950's. The site was an unpermitted unlined dumping area that is believed to be the source of arsenic contamination in the surrounding residential neighborhood.

FEATURES OF DISPOSAL AREA: Currently, the site is a park with playground equipment, tennis and basketball courts, a large open area for soccer and baseball, and a lake. A large man made hill is on site that is used for sledding in the winter. The suspected disposal area is surrounded by mostly residential properties.

HISTORY (complaints, agency, previous action): The site assessment process began in 1989 via an EPA contractor. Bendix reported using the site as a dump until the 1950's. Beck's Lake itself appears to have been created in the late 50's to early 60's. Singer manufacturing also lies in the area and is another potential source for the arsenic contamination that was found in nearby yards. Levels of arsenic above three times background and exceeding benchmarks have been identified in residential yards nearby. Historic aerial photos point to dumping at what is now LaSalle Park as the potential source of arsenic in the soils of the immediately surrounding area.

STATUS: ☐ Active ☒ Inactive ☐ Unknown

WASTE TYPE(s): ☐ Liquid ☒ Solid ☐ Sludge ☐ Gas ☐ Unknown

CHARACTERISTICS: ☐ Corrosive ☐ Ignitable ☐ Volatile ☐ Radioactive ☒ Toxic ☐ Persistent ☐ Reactive ☐ Incompatible ☐ Unknown ☐ Other _____

SECTION III. Hazard Evaluation

SUBSTANCES BELIEVED TO BE PRESENT: Arsenic in soils.
(Refer to Chemical Evaluation Form)

WP-3

SECTION IV. Field and Laboratory Work Required

Establish Perimeter: ☐ Yes ☒ No
Map: ☐ Yes ☒ No
Identify Contamination Zone: ☒ Yes ☐ No
Geophysical Work: ☐ Yes ☒ No
If Yes, specify: _____

Drilling: ☐ Yes ☒ No
Determine location of wells: ☐ Yes ☒ No
Installation plans attached: ☐ Yes ☒ No

Sampling Required: ☒ Yes ☐ No
Identify locations: ☒ Yes ☐ No
Map attached: ☒ Yes ☐ No
If No, attach information
Locations undetermined at this time

Perform Site Recon: ☒ Yes ☐ No
If No, attach information

Designated Laboratory: CLP

WP-4
SECTION V. Quality Assurance Records Log

Site Name: Beck's Lake

Site ID Number: IND980904379

Record and Documentation (check all that apply)	
General Work Plan	X
Safety Plan	X
Log Books	X
Photos	X
Chain of Custody	X
Traffic Reports	X
Field Collected Information	X
Analytical Information	X

QA	
Technical Review	X
Editorial Review	
QA Report	X
QA Record	X
Calibration Record	
Preinspection Meeting	X
Drilling Logs	X
Correspondence	
Reports	

Record Description: Document No.

WP-5
JUSTIFICATION FOR PROPOSED SAMPLES

Beck's Lake
South Bend, St Joseph County., Indiana

Sample No.	Sample Type	Justification
BL1-BL 21	Target, Surface soil	20 samples and one duplicate sample from residential yards surrounding the suspected source will be collected to identify targets for scoring purposes. Locations will be field screened with an XRF.
BL22-BL26	Source, Surface and subsurface soil	Collected from four (4) different locations at the suspected source area (Beck's Lake dump/ LaSalle Park) with one additional duplicate sample. Locations are designed to positively identify the source of area arsenic contamination in soils. Historic aerial photos were used to identify the most likely areas where contamination would be located based on apparent dumping patterns. Locations will be field screened with XRF before collection. Depth of sample collection will be determined by screening results.
BL27-BL33	Background Surface soil	Collected at six (6) different background locations with one duplicate sample to determine background levels for comparison with area soils suspected of being contaminated. These samples will also be used to help ascertain the source of the arsenic contamination by surrounding the suspected source. Locations will be field screened with XRF before collection.
BL34-BL60		These numbers to be used as a contingency in case site conditions or XRF capabilities do not allow for accurate pre-screening of soils prior to collection. The increased capacity of samples represented by these numbers will allow for additional data to assure accurate scoring capability but will only be used if screening capabilities are not reliable.

The possibility does exist that if, during the sampling event, contamination is suspected in different locations, sampling points may be revised.

WP-6
SUMMARY TABLE OF SAMPLING AND ANALYSIS PROGRAM

SAMPLE MATRIX	FIELD PARAMETERS	LABORATORY PARAMETERS	Sample No.	Field Dup.	Field Blank	MS/ MSD[2, 3]	Matrix Total[4]
Soil	XRF Metals	Total Metals	30	3	-	-	33
Contingency: Soil		Total Metals	55	5	-	-	60

1. The field quality control samples also include trip blank, which is required for VOA water samples. One (1) trip blank, which consists of two (2) 40-ml glass vials (preserved) for water samples is shipped in each cooler of VOA samples.

2. Additional sample volume for the matrix spike/matrix spike duplicate (MS/MSD) is required for organic analysis, except for the OLC SOW. Samples designated for MS/MSD analysis will be collected, with extra sample volumes, at a frequency of one per group of 20 or fewer investigative samples. Triple the normal sample volumes will be collected for VOAs, and double the normal sample volumes will be collected for SVOCs and pesticides and PCBs.

3. For inorganic analysis, no extra sample volume is required for the spike and duplicate analyses, however, samples for the spike and duplicate analysis should be identified on the field COC at a rate of one per group of 20 or fewer investigative samples.

**IDENTIFY HERE IF SAMPLES ARE COLLECTED USING ANY OF THE 5035 METHODS, i.e., IN METHANOL, OR IN ENCORE TUBES

4. The number of samples to be collected for MS/MSD is not included in the matrix total. The number of trip blank samples is also excluded from the matrix total.

SUMMARY OF PROCEDURES AND ADDITIONAL COMMENTS *(Sample point selection method):*

Samples collected to identify targets (BL1-BL21) will be field screened with an XRF prior to collection. The samples will be collected from a large residential area south and west of LaSalle Park where arsenic levels were high during the RA. (See area in red on sample location map)

Samples collected from the suspected source area (BL22-BL26) will be collected from locations likely to contain material from the original dumping that occurred on the site during the 1930's-1950s. Samples will be

screened with an XRF to determine the approximate level of arsenic contained in the sample before sending it off to the lab for verification of results. A direct push devise will be used to access different soil depths in case cleaner fill has been placed over historic dumping areas. Samples will be screened at 2 foot intervals at those locations when needed. Any encounter with solid waste materials will be noted and drilling at that location will cease.

Samples collected to identify background levels (BL27-BL33) will also be used to help ascertain the source of the arsenic contamination. Six samples will be screened and sent for analysis at locations suspected to be on the perimeter of the arsenic contamination but surrounding the suspected source. Every attempt will be made to maintain uniformity in soil type and structure for these locations. Samples BL34-BL60 will be used only as a contingency if conditions are not conducive to screening of sample locations with the XRF before sampling. They will become additional samples collected at the suspected source, target areas, and duplicates as required.

All laboratory samples will be analyzed utilizing EPA's CLP.

WP-7
INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
SITE INVESTIGATION PROGRAM
SITE SAFETY PLAN

SECTION I. Site Safety Work Plan

Site Secured: ☐ Yes ☒ No
Perimeter Identified: ☒ Yes ☐ No
Contamination Zones Identified: ☐ Yes ☒ No

Physical Hazards *(Please check each that applies)*

☐ Heightened work surface *Notes/Measurements*:_____

☒ Impact *Notes/Measurements*: Geoprobe® use

☒ Falling or flying objects
☐ Overhead work or projection

☒ Compression *Notes/Measurements*: Geoprobe® use

☒ Rolling or pinching objects
☒ Hands ☒ Feet ☒ Impact

☒ Penetration *Notes/Measurements*: Geoprobe® use

☐ Sharp objects which may pierce the hands or feet.

☒ Heat *Notes/Measurements*: Summer sun, Geoprobe engine

☐ Burns ☐ Radiant Heat ☒ High Humidity
☐ Eye Injury ☒ High Temperatures ☐ Lack of Adequate Ventilation

☐ Cold *Notes/Measurements*:_____

☐ Ionizing & Non-ionizing Radiation *Notes/Measurements*:_____

☐ Gamma Rays ☐ Beta Particles ☐ Alpha particles
☐ Ultraviolet ☐ Infrared ☐ Microwaves (If present contact ISHD Radiological Section 351-7190)

☐ Electrical *Notes/Measurements*:_____

☒ Noise *Notes/Measurements*: Geoprobe® noise

☐ Confined spaces (staff will not enter confined spaces)

SP-1
SECTION I. Site Safety Work Plan
(Continued)

☐ Biological Agents *Notes/Measurements*: Repellants will be available

☐ Tuberculosis ☐ Hepatitis B ☐ Tetanus
☒ Poison Ivy ☒ Insects ☒ Stray Animals

Are Engineering controls possible? ☐ Yes ☒ No (Explain) Residential Properties

Air monitoring will be conducted. Staff will be informed about heat stress.

Are Administrative controls possible? ☒ Yes ☐ No (Explain)

Staff will be instructed to avoid areas of potential risk. A buddy system will be used. Staff will work in groups of at least two persons.

Level of Protection: ☐ A ☐ B ☐ C ☒ D ☐ Unknown

Modifications Protective work Gloves, air monitoring equipment, steel toe safety boots, safety glasses, hard hat, hearing protection

The Project Manager will be responsible for ensuring that all personnel will bring all health and safety equipment and prepare and respond as necessary

Equipment and Materials: Protective nitrile gloves, steel toed work boots, Multi Rae air monitoring equipment, Boot covers, sunscreen, first aid kit, saline eye wash.

Site Entry Procedures: Sample locations may be located in residential areas. When sampling at a private residence permission will be sought prior to sampling. Tailgate safety meeting to review safety hazards and sampling procedures will be conducted prior to start of sampling event.

Exit and Decon Procedures: Every effort will be taken to leave sampling location in same conditions that they were found. Disposable gloves and equipment will be used wherever possible and properly discarded after use. Non disposable items will be bagged and returned to mud room for decontamination

Method of Wastes Disposal Generated as a Result of Inspection: Discarded gloves and scoops will be bagged and properly disposed. Field screened materials that will not be collected for sampling will be returned to the location where they were collected. Geoprobe tailings will be drummed and disposed of in accordance with regulations.
All generated derived waste will be disposed of properly.

SP-2

Personnel Required:

Name	Signature	Training	Duties
Tim Johnson		40 hour HAZWOPER 8 hour current	Project Manager, sampling,
Dan Chesterson		40 hour HAZWOPER 8 hour current	Sampling, Project management assistance, Provide institutional knowledge of site.
TBD			Sampling, GIS, sample documentation photography, Notes
Steve McIntire		40 hour HAZWOPER 8 hour current, Licensed driller	Geoprobe Operator

**By signing this document you are acknowledging that you have read and understand the established safety procedures for site activities. You must also realize that the majority of effective health & safety practices is common sense and requires the constant attention of all site workers. This document may or may not address all hazards associated with this site and may change as site activities occur.*

Work Limitations: Most sever work limitation is possibility of heat and humidity due to summer time frame. Inclement weather (including threat of lightning may facilitate the stopping and rescheduling of Geoprobe operations.

SECTION II. Emergency Information

Site Resources: ☐ Water ☒ Telephone ☒ Radio ☐ Other (specify)_____

Local Resources: See accompanying HASP

Name	Number	Address

Ambulance	Community Ambulance	574-289-5736	2816 W. Sample Street South Bend, IN
Hospital	Memorial Hospital	574-234-9041	615 N. Michigan Street South Bend, IN
Police Dept	South Bend Police Department	911	
Fire Dept.	South Bend Fire Department	911	
Airport	Michiana Regional Airport	574-282-4590	4477 Terminal Drive South Bend, IN
Local Health Dept.	St Joe County Health Department	574-245-6711	227 W. Jefferson Blvd. South Bend IN
Directions to Hospital	See attached directions and map		

SP-3

SECTION III. Emergency Contacts

IDEM Emergency Response	317/233-7745 or 888/233-7745 (24 Hour)
IDEM Health & Safety (Dave Appel)	317/232-4867
IDEM Human Resources (Corliss White)	317/233-1785
IDEM Vehicle Problems (Nicole Kane)	317/232-4518
ISDH Epidemiologist (LaNetta Alexander)	317/351-7190 ext. 262
ISDH Radiological (Rex Bowser)	317/351-7190 ext. 257
CDC/ATSDR Emergency Response	404/498-0120 (24 Hour)
EPA National Response Center	800/424-8802 (24 Hour)
Indiana State Chemist Office	765/494-1492
Poison Center	800/222-1222
IDEM Northern Regional Office	574/245-4870 or 800/753-5519
IDEM Northwest Regional Office	219/757-0265 or 888/209-8892
IDEM Southwest Regional Office	812/380-2305 or 888/672-8323

FIELD MONITORING EQUIPMENT CHECK-OUT
(Use separate form for each piece of equipment used)

Type of Instrument: INNOV-X XRF,

Serial Number: _____

Date of Calibration: _____

Type of Calibrate Gas: _____

_____

Fully Charged: ☒ Yes ☐ No

Type of Instrument: Multi Rae

Serial Number: _____

Date of Calibration: Calibrated prior to use

Type of Calibrate Gas: PID: 100 ppm Isobutylene

Chemical sensors: mixed gases to manufacturer specifications

SP-4

FIELD MONITORING RESULTS

		Breathing Zone*	Work Zone
1.	Location of monitoring _____	☐	☐
	Results (peak reading) _____	☐	☐
2.	Location of monitoring _____	☐	☐
	Results (peak reading) _____	☐	☐
3.	Location of monitoring _____	☐	☐
	Results (peak reading) _____	☐	☐
4.	Location of monitoring _____	☐	☐
	Results (peak reading) _____	☐	☐
5.	Location of monitoring _____	☐	☐
	Results (peak reading) _____	☐	☐
6.	Location of monitoring _____	☐	☐
	Results (peak reading) _____	☐	☐

** Breathing zone is identified as a hemisphere surrounding the lower half of the face*

Do air monitoring results modify original PPE selection? ☐ YES ☐ NO

Describe modifications to level of PPE:

_____

_____

Monitoring Action Levels

Photo Ionization Detector (MiniRae, HNu) and Flame Ionization Detectors (FID)

Known Constituents

0-5 meter units	Level D
5-50 meter units *	Level C
50-500 meter units*	Level B
>500 meter units*	Leave Area

* The aforementioned levels are valid only for known compounds detected in the breathing zone and are superceded by chemical specific permissible exposure levels (PEL).

SP-5

Unknown Constituents

0-5 meter units	Level D
5-20 meter units	Level C
20-100 meter units	Level B
>100 meter units	Leave Area

Combustible Gas Indicator

0-10% LEL	Continue investigation
10-15% LEL	Continue with caution
>15% LEL	Leave Area, Fire Hazard

Oxygen Meter

<19.5%	Supplied air (SCBA) required
19.5-23.5%	Continue with caution
>23.5%	Leave Area, Increased fire hazard

All measurements for known and unknown constituents must be conducted in the breathing zone

1. Head **south** on **S Lake St** toward **W Jefferson Blvd**	go 0.2 mi total 0.2 mi
Show: Text only | Map | Street View	
2. Take the 2nd **left** onto **W Western Ave** About 9 mins.	go 2.2 mi total 2.4 mi
Show: Text only | Map | Street View	
3. Turn **left** at **S Lafayette Blvd** Destination will be on the right About 1 min	go 0.2 mi total 2.6 mi
Show: Text only | Map | Street View	

SP-6

Geoprobe Safety Information

THE GEOPROBE OPERATOR WILL HAVE FINAL DECISION ON WHERE TO DRILL, HOW TO DRILL AND WHEN TO CEASE OPERATIONS.

This project will include the use of the Geoprobe drill rig.
There are inherent dangers in using any drill rig. These dangers include but are not limited to:

- Compression from moving parts or treads.
- Head and carbon monoxide from the diesel engine on the Geoprobe.
- Noise from the engine, hydraulics, rotating equipment, and or hammer attachments.
- Potentially unguarded rotating parts.
- Lifting and handling heavy parts.
- Contact with utilities [overhead or buried].
- Lightning, inclement weather.

To mitigate these hazards, one (1) person shall be designated as the operator. This individual will be in complete control of the Geoprobe operation and will determine the following:

- Have all boring sites been identified and evaluated prior to beginning drilling activities?
- Have all utilities been adequately marked?
- Is the location reasonable safe to conduct subsurface activities?
- If any other individuals are allowed in the vicinity of the Geoprobe while it is operating?
- Is the weather forecast/actual conditions a factor and is there a chance for lightning is the drilling area.

Any Changes to boring locations or alterations to the work plan must be evaluated and approved by the Geoprobe operator. The operator will have the ultimate decision on location and specifics of the boring operations. Encounters with solid waste or other hazardous materials during drilling will warrant immediate abandonment of the boring location.

Air monitoring will be conducted continuously when the Geoprobe is being operated.

The Geoprobe should not be moved while the drill rig is extended.

No persons shall ride on the Geoprobe.

The Geoprobe has limitations related to operating on slopes. The designated operator will determine use in these situations.

SP-7

PROTECTING WORKERS IN HOT ENVIRONMENTS

Many workers spend some part of their working day in a hot environment. Workers in foundries, laundries, construction projects and bakeries –- to name a few industries –- often face hot conditions which pose special hazards to safety and health.

HEAT STRESS CAUSES BODY REACTIONS

Four environmental factors affect the amount of stress a worker faces in a hot work area: temperature, humidity, radiant heat (such as from the sun or a furnace) and air velocity. Perhaps most important to the Level of stress an individual faces are personal characteristics such as age, weight, fitness, medical condition and acclimatization to the heat.

The body reacts to high external temperature by circulating blood to the skin which increases skin temperature and allows the body to give off its excess heat through the skin. However, if the muscles are being used for physical labor, less blood is available to flow to the skin and release the heat.

The body reacts to high external temperature by circulating blood to
The skin which increases skin temperature and allows the body to give off its excess heat through the skin. However, if the muscles are being used for physical labor, less blood is available to flow to the skin and release the heat.

Sweating is another means the body uses to maintain a stable internal
body temperature in the face of heat. However, sweating is effective only if the humidity level is low enough to permit evaporation, and if
the fluids and salts lost are adequately replaced.

Of course there are many steps a person might choose to take to reduce the risk of heat stress, such as moving to a cooler place, reducing the work pace or load, or removing or loosening some clothing.

But the body cannot dispose of excess heat, it will store it. When this happens, the body’s core

temperature rises and the heart rate increases. As the body continues to store heat, the individual begins to lose concentration and has difficulty focusing on a task, may become irritable or sick and often loses the desire to drink. The next stage is most often fainting and death is possible if the person is not removed from the heat stress.

HEAT DISORDERS

Heat stroke, the most serious health problem for workers in hot environments, is caused by the failure of the body's internal mechanism to regulate its core temperature. Sweating stops and the body can no longer rid itself of excess heat. Signs include (1) mental confusion, delirium, loss of consciousness, convulsions or coma; (2) a body temperature of 106 degrees F or higher; and (3) hot dry skin which may be red, mottled, or bluish. Victims of heat stroke will die unless treated promptly. While awaiting medical help, the victim must be removed to a cool area and his or her clothing soaked with cool water. He or she should be fanned vigorously to increase cooling. Prompt first aid can prevent permanent injury to the brain and other vital organs.

Heat exhaustion results from loss of fluid through sweating when a worker has failed to drink enough fluids or take in enough salt or both. The worker with heat exhaustion still sweats but experiences extreme weakness or fatigue, giddiness, nausea, or headache. The skin is clammy and moist, the complexion pale or flushed, and the body temperature normal or slightly higher. Treatment is usually simple: the victim should rest in a cool place and drink an electrolyte solution (a beverage used by athletes to quickly restore potassium, calcium, and magnesium salts). Severe cases involving victims who vomit or lose consciousness may require longer treatment under medical supervision.

Heat cramps, painful spasms of the muscles, are caused when workers drink large quantities of water but fail to replace their bodies' salt loss. Tired muscles -- those used for performing the work -- are usually the ones most susceptible to cramps. Cramps may occur during or after working hours and may be relieved by taking liquids by mouth or saline solutions intravenously for quicker relief, if medically determined to be required.

Fainting (heat syncope) may be a problem for the worker un-acclimatized to a hot environment who simply stands still in the heat. Victims usually recover quickly after a brief period of lying down. Moving around, rather than standing still, will usually reduce the possibility of fainting.

Heat rash, also known as prickly heat, may occur in hot and humid environments where sweat is not easily removed from the surface of the skin by evaporation. When extensive or complicated by infection,

heat rash can be so uncomfortable that it inhibits sleep and impedes a worker's performance or even results in temporary total disability. It can be prevented by resting in a cool place and allowing the skin to dry.

PREVENTING HEAT STRESS

Most heat-related health problems can be prevented or the risk of developing them reduced. Following a few basic precautions should lessen heat stress.

1. A variety of **engineering controls** including general ventilation and spot cooling by local exhaust ventilation at points of high heat production may be helpful. Shielding is required as protection from radiant heat sources. Evaporative cooling and mechanical refrigeration are other ways to reduce heat. Cooling fans can also reduce heat in hot conditions. Eliminating steam leaks will also help. Equipment modifications, the use of power tools to reduce manual labor and personal cooling devices or protective clothing are other ways to reduce the hazards of heat exposure for workers.

2. **Work practices** such as providing plenty of drinking water -- as much as a quart per worker per hour -- at the workplace can help reduce the risk of heat disorders. Training first aid workers to recognize and treat heat stress disorders and making the names of trained staff known to all workers is essential. Employers should also consider an individual worker's physical condition when determining his or her fitness for working in hot environments. Older workers, obese workers and personnel on some types of medication are at greater risk.

3. Alternating **work and rest** periods with longer rest periods in a cool area can help workers avoid heat stress. If possible, heavy work should be scheduled during the cooler parts of the day and appropriate protective clothing provided. Supervisors should be trained to detect early signs of heat stress and should permit workers to interrupt their work if they are extremely uncomfortable.

4. **Acclimatization** to the heat through short exposures followed by longer periods of work in the hot environment can reduce heat stress. New employees and workers returning from an absence of two weeks or more should have 5-day period of acclimatization. This period should begin with 50 percent of the normal workload and time exposure the first day and gradually building up to 100 percent on the fifth day.

5. **Employee education** is vital so that workers are aware of the need to replace fluids and salt lost through sweat and can recognize dehydration, exhaustion, fainting, heat cramps, salt deficiency, heat exhaustion, and heat stroke as heat disorders. Workers should also be informed of the importance of daily weighing before and after work to avoid dehydration.

SP-10